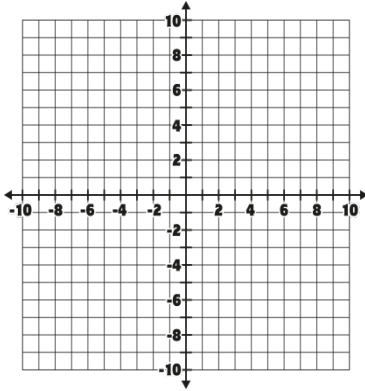


## Solving Quadratic Equations

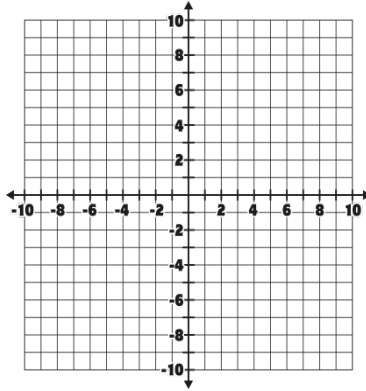
Graphing: Find the roots (x-intercepts) to identify the solutions.

$$x^2 + 2x + 3 = 0$$



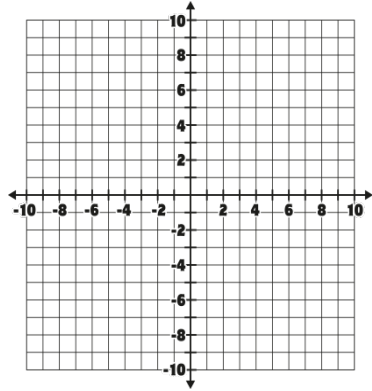
$x =$

$$-2(x - 2)^2 = 0$$



$x =$

$$-3(x - 1)(x + 2) = 0$$



$x =$

Square Roots: When we square root we use  $\pm$  to indicate both positive and negative square root.

$$10x^2 = -90$$

$$2(k + 1)^2 = 16$$

$$6(w - 3)^2 + 4 = 21$$

Factoring: Use the zero product property to find the solutions.

$$(3x - 1)(x - 2) = 0$$

$$x^2 - 4x + 4 = 0$$

$$2x^2 + 5x - 12 = 0$$

Completing the Square: Add  $(\frac{b}{2})^2$  to both sides and solve using square roots.

$$x^2 + 4x = 6$$

$$2y^2 - 8y = -10$$

Quadratic Formula:  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$3x^2 + 13x - 10 = 0$$

$$2x^2 - 3x - 4 = 0$$

$$x^2 - 4x + 5 = 0$$

Solving Nonlinear Systems: Solve the system of equations using graphing, substitution, or elimination.

$$\begin{aligned} y &= x^2 + x - 6 \\ y &= -x^2 - x + 6 \end{aligned}$$

$$\begin{aligned} y &= x^2 + 3 \\ x^2 + y^2 &= 9 \end{aligned}$$

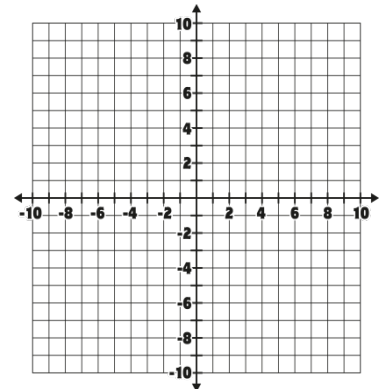
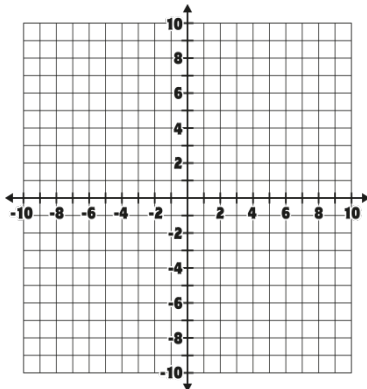
$$\begin{aligned} y &= x^2 + 4x + 1 \\ y &= 2x - 1 \end{aligned}$$

Quadratic Inequalities: Solve quadratic inequalities in one variable by graphing or algebraically. Graph quadratic inequalities in two variables by graphing the quadratic (dashed or solid line) and using a test point to determine shading for the solution set.

$$x^2 + 2x + 3 < 0$$

$$2x^2 + 5x > -2$$

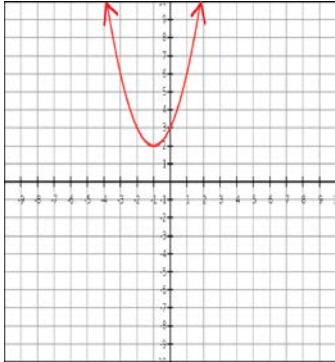
$$y \geq x^2 + 5x + 4$$



## Solving Quadratic Equations

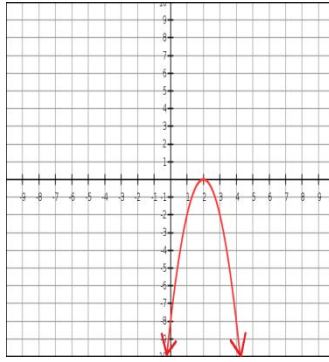
Graphing: Find the roots (x-intercepts) to identify the solutions.

$$x^2 + 2x + 3 = 0$$



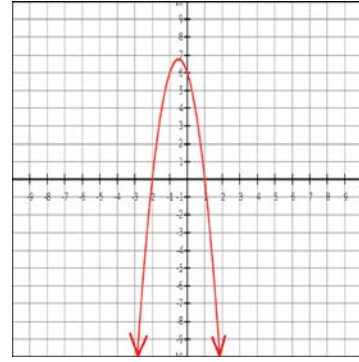
$x = \text{no solutions}$

$$-2(x - 2)^2 = 0$$



$x = 2$

$$-3(x - 1)(x + 2) = 0$$



$x = -2, 1$

Square Roots: When we square root we use  $\pm$  to indicate both positive and negative square root.

$$10x^2 = -90$$

$$x = \pm 3i$$

$$2(k + 1)^2 = 16$$

$$k = -1 \pm 2\sqrt{2}$$

$$6(w - 3)^2 + 4 = 21$$

$$w = 3 \pm \frac{\sqrt{102}}{6}$$

Factoring: Use the zero product property to find the solutions.

$$(3x - 1)(x - 2) = 0$$

$$x = \frac{1}{3}, 2$$

$$x^2 - 4x + 4 = 0$$

$$x = 2$$

$$2x^2 + 5x - 12 = 0$$

$$x = -4, \frac{3}{2}$$

Completing the Square: Add  $\left(\frac{b}{2}\right)^2$  to both sides and solve using square roots.

$$x^2 + 4x = 6$$

$$x = -2 \pm \sqrt{10}$$

$$2y^2 - 8y = -10$$

$$y = 2 \pm i$$

Quadratic Formula:  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$3x^2 + 13x - 10 = 0$$

$$x = -5, \frac{2}{3}$$

$$2x^2 - 3x - 4 = 0$$

$$x = \frac{3 \pm \sqrt{41}}{4}$$

$$x^2 - 4x + 5 = 0$$

$$x = 2 \pm i$$

Solving Nonlinear Systems: Solve the system of equations using graphing, substitution, or elimination.

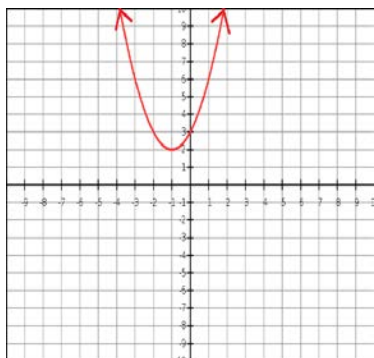
$$\begin{aligned} y &= x^2 + x - 6 \\ y &= -x^2 - x + 6 \\ (-3, 0), (2, 0) \end{aligned}$$

$$\begin{aligned} y &= x^2 + 3 \\ x^2 + y^2 &= 9 \\ (0, 3) \end{aligned}$$

$$\begin{aligned} y &= x^2 + 4x + 1 \\ y &= 2x - 1 \\ \text{no solutions} \end{aligned}$$

Quadratic Inequalities: Solve quadratic inequalities in one variable by graphing or algebraically. Graph quadratic inequalities in two variables by graphing the quadratic (dashed or solid line) and using a test point to determine shading for the solution set.

$$x^2 + 2x + 3 < 0 \quad \text{no solution}$$



$$2x^2 + 5x > -2$$

$$x < -2 \text{ or } x > -\frac{1}{2}$$

$$y \geq x^2 + 5x + 4$$

